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WHAT IS CLAIMED IS:

1. A magnetic actuator comprising:

a first yoke made of an assembly of laminated metal sheets;

a second yoke affixed to the first yoke;

a permanent magnet;

an armature which is provided inside the first yoke and made movable in reciprocating motion over a specific stroke between a first position and a second position along a first direction;

at least one coil; and

an actuating mechanism for causing the armature to move along said first direction;

wherein the armature constitutes a first magnetic circuit of a flux generated by the coil together with the first yoke and moves toward one of said first and second positions when the coil is excited, the permanent magnet is located in a second magnetic circuit of a flux generated by the permanent magnet, the second magnetic circuit passing through the permanent magnet, the first yoke, the second yoke and the armature, and wherein the armature is held at one of said first and second positions by the flux generated by the permanent magnet.

2. A magnetic actuator comprising:

a first yoke made of an assembly of laminated metal sheets;

a second yoke affixed to the first yoke;

a permanent magnet affixed to the second yoke;

an armature which is provided inside the first yoke and made movable in reciprocating motion over a specific stroke between a first position and a second position along a first direction;

a first coil fitted to the first yoke; and

a second coil fitted to the first yoke;

wherein the armature constitutes a first magnetic circuit of a flux generated by one of the first and second coils together with the first yoke and moves toward one of said first and second positions when one of the first and second coils is excited, the permanent magnet is located in a second magnetic circuit of a flux generated by the permanent magnet, the second magnetic circuit passing through the permanent magnet, the first yoke, the second yoke and the armature, and wherein the armature is held at one of said first and second positions by the flux generated by the permanent magnet.

3. The magnetic actuator according to claim 1, wherein the permanent magnet is provided between the first yoke and the second yoke, at an end surface of the second yoke

facing the armature, or between elements constituting the second yoke.

4. The magnetic actuator according to claim 1, wherein a second magnetic air gap G2 is formed between said second position and an end surface of the armature facing said second position when the armature is held at said first position, and a first magnetic air gap G1 differing from said second magnetic air gap G2 is formed between said first position and an end surface of the armature facing said first position when the armature is held at said second position.

5. The magnetic actuator according to claim 1, wherein the second yoke is oriented along said first direction.

6. The magnetic actuator according to claim 1, wherein the second yoke is oriented along a second direction which is perpendicular to said first direction.

7. The magnetic actuator according to claim 1, wherein the second yoke is made of an assembly of laminated metal sheets.

8. The magnetic actuator according to claim 1, wherein

the cross-sectional area of a lower yoke section of the first yoke is smaller than the cross-sectional area of an upper yoke section of the first yoke.

9. The magnetic actuator according to claim 1, wherein the first yoke has stepped surfaces such that a partial air gap is created between the first yoke and the armature when the armature is held at either of the first and second positions.

10. The magnetic actuator according to claim 1 further comprising:

a jack bolt fitted to the second yoke;
wherein the permanent magnet is affixed to the second yoke and an air gap between the armature and the permanent magnet can be varied by operating the jack bolt, making it possible to insert a thin metal sheet between the second yoke and the first yoke.

11. The magnetic actuator according to claim 2, wherein a magnetomotive force produced by the first coil differs from a magnetomotive force produced by the second coil.

12. The magnetic actuator according to claim 1,

wherein the coil is a set of multiple coils.

13. The magnetic actuator according to claim 1,
wherein the cross-sectional area of an end portion of the
armature through which the fluxes pass, the end portion
facing the first yoke, is smaller than the cross-sectional
area of other portions of the armature through which the
fluxes pass.

14. The magnetic actuator according to claim 1,
wherein the armature is made of an assembly of laminated
metal sheets.

15. The magnetic actuator according to claim 14,
wherein the armature is made of an assembly of laminated
metal sheets which are bound together with solid end
plates placed at both ends of the laminated metal sheet
assembly.

16. The magnetic actuator according to claim 15,
wherein the armature is made of an assembly of laminated
metal sheets which are bound together with solid end
plates placed at both ends of the laminated metal sheet
assembly, and wherein peripheral surfaces of each of the
end plates are positioned slightly on the inside of end

surfaces of the laminated metal sheet assembly.